p = 0.12–0.95). No or low correlations were found between the three measures of sensory function and the KOOS subscales (r = 0.00–0.29, p = 0.04–0.98) and the TAS (rs = −0.05–0.35, p = 0.02–0.75), respectively.
Conclusions: The low, or lack of, correlation between TDPM and VPT suggest that these measures of sensory function cannot be used interchangeably in subjects with ACL injury or in their control counterparts. These measurements were weakly related to both hop performance, activity level and the patient's perceived symptoms, function and activities implying that both knee kinesthesia and vibration sense only affect motor performance, activity level and patients' perception of function to a limited degree.

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STUDY OF RISK FACTORS FOR KNEE AND HIP TOTAL REPLACEMENT IN AN INTRAHOSPITALARY COHORT: A SURVIVAL ANALYSIS

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Purpose: Our aim was to analyze the influence of different demographic, clinical and radiographic variables in the rate of total knee and hip replacement.
Methods: Consecutive patients diagnosed with knee and/or hip osteoarthritis (OA) attending the Rheumatology and the Traumatology outpatient clinics of the Hospital Clínico San Carlos (Madrid, Spain), were recruited, between October 2007, and May 2009. Demographic (gender, age), clinical [age at pain onset, age at OA disease diagnosis, body mass index (BMI), WOMAC score] and radiographic [Kellgren and Lawrence radiographic grade (KL)] variables were collected at baseline. Patients were followed up until death or November the 1st, 2013, and clinical records were examined for total joint replacement (TJR). Time at risk for each joint (right and left knee/hip) comprised the elapsed time between inclusion in the study and TJR, death or November the 1st, 2013. Survival techniques were used to estimate the incidence ratio (IR) of TJR, expressed per 1000 joint-years with 95% confidence interval [95%CI]. Cox bivariate and multivariate regression models were conducted to examine the risk factors for TJR. Proportionality of the models was tested using the Schoenfeld and the scaled Schoenfeld residuals. Results were expressed as hazard ratios (HRs) with [95% CIs].
Results: 194 subjects were included in the study (follow-up of 3596 joint-years). There were 74 total joint replacements, in 63 patients, with an IR of 21 per 1000 patient-year [95% confidence interval 16–26]. IR for knee and hip TJR were 36 [28–46], and 8 [5–13], respectively. IR was higher in the subjects recruited at the Traumatology outpatient clinic (30 [23–40] vs. 11 [7–17], p = 0.0001). Moreover, those patients had higher baseline total WOMAC score (median 51 (inter-quartile rank 33–63) vs. 34 (26–42), p < 0.0001), BMI (30.80 (26.67–33.30) vs. 28.72 (25.59–31.07), p = 0.0033), and previous contra lateral TJR (10.68% vs. 1.10%, p = 0.003). Proportion of subjects with KL grade III–IV was also higher in the Traumatology group (19.42% vs. 7.69%, p = 0.060). In the multivariate analysis, predictors of joint replacement were previous TJR of the contra lateral joint (HR 3.02 [1.39–6.58], p = 0.005), baseline KL (I versus 0: HR 1.06 [0.07–15.43], p = 0.966, II vs. 0: HR 2.74 [0.81–9.25], p = 0.105, III vs. 0: HR 9.94 [3.94–24.54], $p = 9.50 \times 10^{-7}$, IV vs. 0: HR 17.26 [7.24–41.16], $p = 1.33 \times 10^{-10}$), and total WOMAC score (HR: 1.03 [1.01–1.04], p = 0.002), adjusted by gender, age and outpatient clinic when and where the patient was recruited, BMI, and joint analyzed. Although baseline KL of the contra lateral joint, BMI, and place of recruitment (Traumatology vs. Rheumatology) were also associated with higher rate of joint replacement in the bivariate analysis, no association was observed in the multivariate analysis.
Conclusions: Presence of TJR of the knee or hip is a risk factor for future replacement of the contra lateral joint, regardless the extent of the basal radiological damage, and clinical status of the patient.

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THE ASSOCIATION BETWEEN KNEE CONFIDENCE AND MUSCLE POWER, HOP PERFORMANCE, AND MOVEMENT QUALITY IN PEOPLE WITH ANTERIOR CRUCIATE LIGAMENT INJURY AT HIGH RISK OF KNEE OSTEOARTHRITIS

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Purpose: To investigate associations between self-reported knee confidence and muscle power, hop performance, and movement quality, in patients with anterior cruciate ligament (ACL) injury at high risk of knee osteoarthritis.
Methods: Cross-sectional data from 54 patients (mean age 30 years, range 20–39, 28% women) with an ACL injury, treated with rehabilitation with or without addition of reconstructive surgery, assessed 3 years (SD 0.9) after injury was used. The dependent variable was the patient's reported trouble with lack of knee confidence on a 5-point Likert scale from the Knee injury and Osteoarthritis Outcome Score (KOOS), scored from 0 (no at all) to 4 (extremely troubled). Independent variables included 3 muscle power tests (knee extension, knee flexion, leg press), 3 hop performance tests (vertical jump, one-leg hop, side hop), and 5 tasks resembling daily activities (body-weight-altering test, single-limb mini squat, tiptoe standing single-limb mini squat, forward lunge, and mini-squat) for the assessment of movement quality, in terms of visual observation of the position of joints in relation to each other and the environment. The absolute value, and the Limb Symmetry Index (LSI, injured leg divided by uninjured and multiplied by 100) value, were used for muscle power and hop tests. A lower absolute value and a lower LSI (larger side-to-side difference) indicate worse muscle function. For movement quality, the total score for all five tasks on the injured side, the total score for the position of the knee relative to the foot on the injured side, the total score for displacement of the hip on the injured side, and the absolute difference in total score between injured and uninjured sides were used in the analysis. A higher total score and a larger side-to-side difference indicate worse movement quality.
Spearman's rank correlation analysis was used to test the association between knee confidence and muscle power, hop performance, and movement quality. Correlations with p-values <0.25 were included in the multivariate ordinal regression model with the negative log-log link.
Results: Sixteen (29.6%) patients reported no trouble with lack of confidence in their knee. Twenty-four (44.4%) were mildly troubled, 10 (18.5%) moderately troubled, 3 (5.6%) severely troubled and 1 (1.9%) extremely troubled with lack of confidence in the knee. Those who scored that they were severely or extremely troubled were combined in the analysis (n = 4).
Significant associations were found between worse knee confidence and lower vertical jump height for the injured leg (rs = −0.215, p = 0.119), higher side-to-side difference (lower LSI) for knee extension power (rs = −0.340, p = 0.012), side hop (rs = −0.330, p = 0.015), and vertical jump (rs = −0.351, p = 0.009). Worse knee confidence was also associated with worse movement quality in terms of higher total score for all tasks for the injured side (rs = 0.424, p = 0.002), higher total score for knee position (rs = 0.399, p = 0.003) and hip position (rs = 0.183, p = 0.189) for the injured leg. In the multivariate analysis, a larger side-to-side difference for the vertical jump (estimate −0.031, 95% CI −0.060 to −0.001, p = 0.043) and the side hop (estimate −0.022, −0.039 to 0.005, p = 0.012) remained in the model. The model accounted for 25% of the variation in perceived knee confidence (Negelkerke R2 = 0.250).
Conclusions: A larger side-to-side difference (lower LSI) in the vertical jump and the side hop are associated with worse knee confidence at a mean of 3 years after ACL injury. Altered movement quality during the performance of tasks resembling daily activities did not add any additional information. This suggests that the final phase of treatment should target exercises aiming at reducing side-to-side differences for demanding tasks, such as single-limb jumping, to improve knee confidence in people with ACL injury.

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CHANGES IN STATIC AND DYNAMIC KNEE EXTENSOR STRENGTH AFTER TKA

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Quadriceps weakness is associated with deficits in functional performance in patients with end-stage knee osteoarthritis. Recovery of quadriceps strength has been shown to influence functional outcomes following total knee arthroplasty (TKA); with evidence that patients have persistent deficits in both quadriceps strength and functional performance years after surgery. However, quadriceps strength is typically assessed statically (isometric contractions), whereas activities of daily living require muscles to generate forces dynamically. Therefore, the Purpose of this study

was to assess the changes in static (isometric) and dynamic (power = torque × angular velocity) measures of knee extensor strength in patients undergoing total knee TKA and to examine the accompanying changes in functional performance.

Methods: Patients undergoing TKA participated in a functional assessment before surgery and after surgery at the time of discharge from physical therapy (~3 months after TKA). The functional assessment was comprised of quadriceps strength testing and a series of functional performance tests. Static strength was assessed during maximal voluntary isometric contractions (MVIC). Dynamic strength was quantified as peak power produce during isokinetic and isotonic contractions. The isokinetic contractions were performed at three velocities (60, 90, and 120 deg/s) determined to cover a range of knee angular velocities observed during functional tasks. The isotonic contractions were performed against three resistances, which were standardized as percentage of body weight (20, 30, and 40% body weight). The functional performance tests included timed up-and-go (TUG), stair climbing test (SCT), and 6-minute walk (6MW). Changes in each strength measure and functional performance measure between testing sessions were assessed.

Results: Preliminary data from 3 subjects (#1 and #2 were men and #3 was a woman) who completed both before surgery (Pre) and after discharge from outpatient physical therapy (3mos) are presented here (Fig. 1). Subject #1 showed a reduction in MVIC strength, small but mixed results for peak power across isokinetic resistances, and was unable to move the isotonic resistances at 30 and 40%BW at both time points. Subjects #2 and #3 increased their isometric strength, but peak power only increased across velocities and resistances for subject #3. Although subject #2 showed an increase in MVIC strength, he also exhibited reductions in peak isotonic power and minimal differences in peak isokinetic power. All subjects showed some improvement in 6MW distance, whereas performance times for the TUG and SCT differed across tasks and among subjects.

Discussion: Our preliminary findings show that changes in static and dynamic quadriceps strength in patients who undergo TKA do not always change in the same direction. The mixed results across subjects for the strength and functional performance measures suggests that static and dynamic strength measures may be necessary to fully understand the role that the knee extensors play in functional ability following TKA.

Conclusions: These findings suggest that further study of dynamic strength may provide additional insight into the factors responsible for persistent functional deficits in patients after TKA.

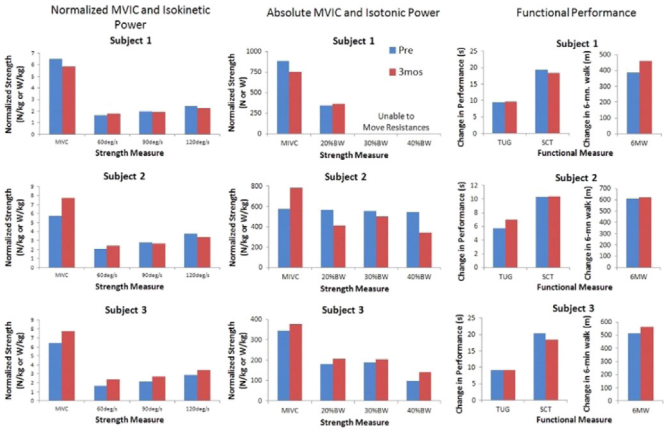

Fig. 1. Data for three subjects prior to total knee arthroplasty (Pre) and approximately 3 months after surgery, following outpatient physical therapy (3mos). Maximal voluntray isometric contraction (MVIC), peak isokinetic power at three joint velocities (60, 90, & 120 deg/), peak isotonic power at three body weight standardized resistances (20, 30, & 40% BW), and functional performance during the timed up-and-go (TUG), stair climbing test (SCT), and 6-minute walk (6MW) are presented for each subject at each time point.

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KNEE FUNCTION AND KOOS INDEX IN SUBJECTS WITH DIFFERENT RADIOGRAPHIC TYPES OF KNEE OSTEOARTHRITIS BASED ON AN ESTONIAN LONGITUDINAL STUDY

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Background: Development of knee osteoarthritis (KOA) is slow and insidious, with nonlinear or phasic progression (Kumm et al. 2013). Our follow-up study of a middle-aged population based cohort during six years, using KOOS index, revealed a signi-ficant decrease in some self-reported functional abilities. In this report we present the data from the last three-year period.

Aims: 1) To characterize the status of subsets of patients with early and advanced knee OA using the KOOS questionnaire; **2)** to investigate associations between the functional abilities of the lower limb and their radiographic knee OA in the same subsets of patients.

Material and methods: A cohort of 173 subjects (109 female and 64 male) from a symptomatic and a non-symptomatic Estonian population with a mean age of 50 (36–62) years was studied. The status of their knees was assessed before and after a three year period using the KOOS questionnaire, functional performance tests and radio-graphy. Functional performance was assessed (**1**) by stair climbing test (SCT, the highest steps in cm; separately with left and right leg); (**2**) rising from the low chair (RC) (the lowest height, in cm); (**3**) timed UP&GO test (TUG, sec) and (**4**) 30 m walking test (with maximal speed, sec). For SCT and RC test stool was used (Picture 1). Radiographs from the tibio-femoral (TF) joint and axial radio[[Unsupported Character – Codename -]]graphs of the patello-femoral (PF) joint of both knees were taken at baseline and three years later and assessed according to Cooper and Spector (1992) and Nagaosa-Doherty (2000) systems. According to longitudinal follow-up, the study subjects were divided into six groups (Table 1, G1–G6).

KOOS questionnaire has five subscales: symptoms (S), pain (P), activities of daily living (ADL), sport/recreation (SP/REC) and quality of life (QL) were used. The last two subscales distinguish it from WOMAC index. Non-parametric statistics was used for this study.

Results:

KOOS results. As expected, highly significant differences in all 5 subscales were observed between the patients (G2–G6) and the controls (G1). Among the patients with knee complaints significant differences were found for female patients between group G2 and group G4: Sp/Rec ($p = 0.02$) and QL ($p = 0.002$). The differences were even more pronounced for female patients between G2 and G6 (with progressive OA): Sp/Rec ($p = 0.0004$) and QL ($p = 0.014$). Differences with the other groups (G3 and G5) were statistically not significant.

Functional tests and radiography. The results of the chair tests and 30 m walk but not the TUG test, were significantly different for the patients (G2–G6) and the controls (G1). In more advanced OA cases (G4 and G6) the TUG results were slower for female patients from G4 and G6 than for those from G2. The differences were much more expressed between the above groups in all stool tests: RC ($p = 0.001$–0.00004), SCT ($p = 0.003$–0.0003). The differences between G2 and the other radiographic groups (G3 and G5) were statistically not significant.

Conclusions:

1. Highly significant differences were observed between the patients and the controls in all KOOS subscales as well as in three out of four performance tests.
2. A significant decline was found in the KOOS subscales Sp/Rec and QL for female patients with advanced (G4) and progressive (G6) knee OA.
3. Female patients with advanced (G4) and progressive (G6) knee OA showed lower ability in the chair tests compared with those without radiographic OA. The early radiographic groups (G3 and G5) did not differ from cases without OA (G2).
4. The test stool is a simple and practical device for quantitative assessment of the ability of the lower limb and for identifiying advanced OA forms.

Clinical and radiographic caharacterization of the groups.